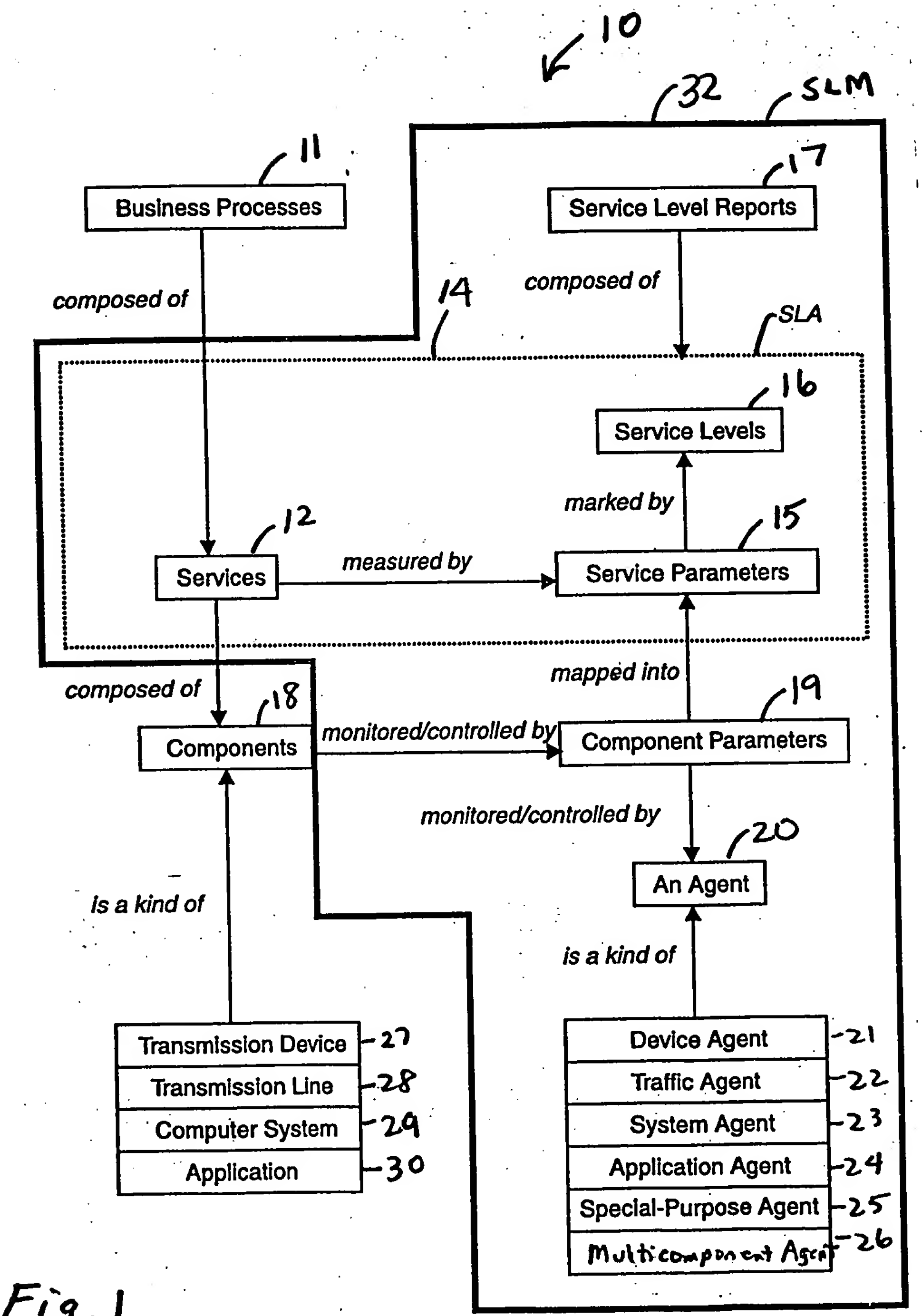

10
32
SLM
11
Business Processes
17
Service Level Reports
composed of
14
composed of
SLA
16
Service Levels
marked by
12
15
Services
measured by
Service Parameters
mapped into
composed of
18
19
Components
monitored/controlled by
Component Parameters
monitored/controlled by
20
An Agent
is a kind of
is a kind of
Transmission Device
27
Transmission Line
28
Computer System
29
Application
30
Device Agent
21
Traffic Agent
22
System Agent
23
Application Agent
24
Special-Purpose Agent
25
Multicomponent Agent
26

Fig. 1

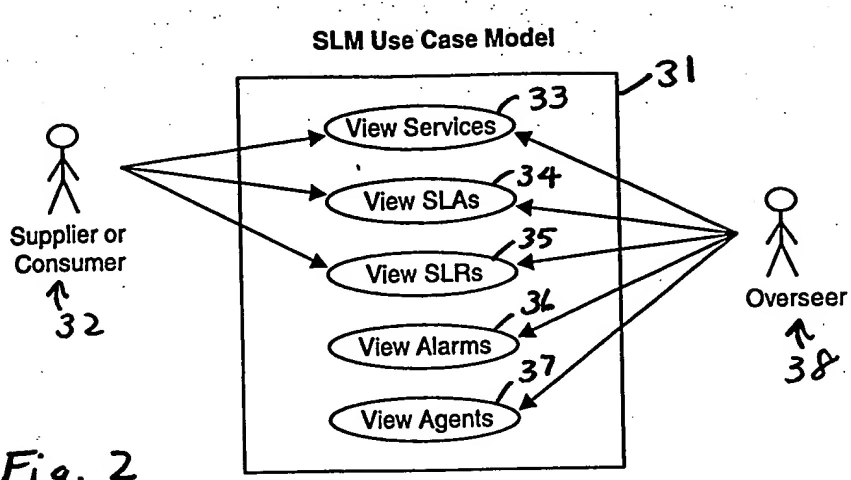

SLM Use Case Model
31
Supplier or Consumer
32
View Services
33
View SLAs
34
View SLRs
35
View Alarms
36
View Agents
37
Overseer
38

Fig. 2

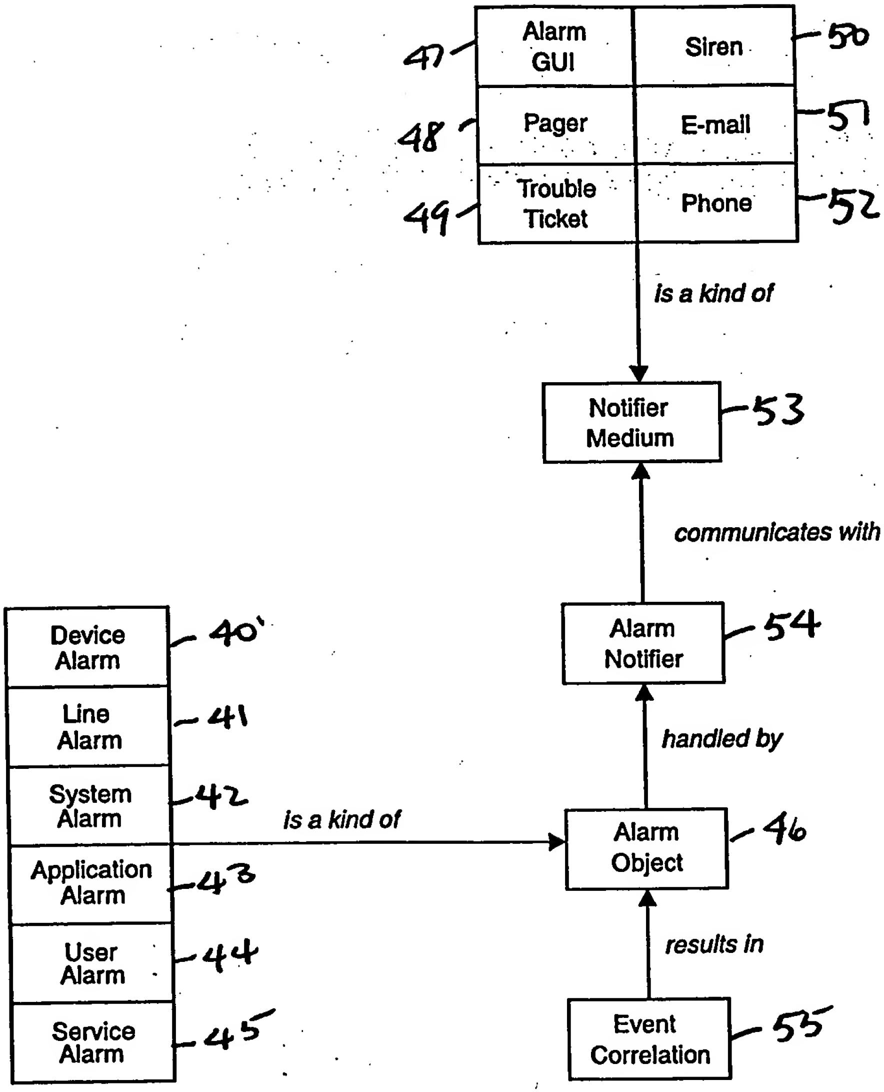

Alarm GUI
Siren
Pager
E-mail
Trouble Ticket
Phone
47
48
49
50
51
52
is a kind of
Notifier Medium
53
communicates with
Alarm Notifier
54
handled by
Device Alarm
40'
Line Alarm
41
System Alarm
42
Application Alarm
43
User Alarm
44
Service Alarm
45
is a kind of
Alarm Object
46
results in
Event Correlation
55

Fig. 3

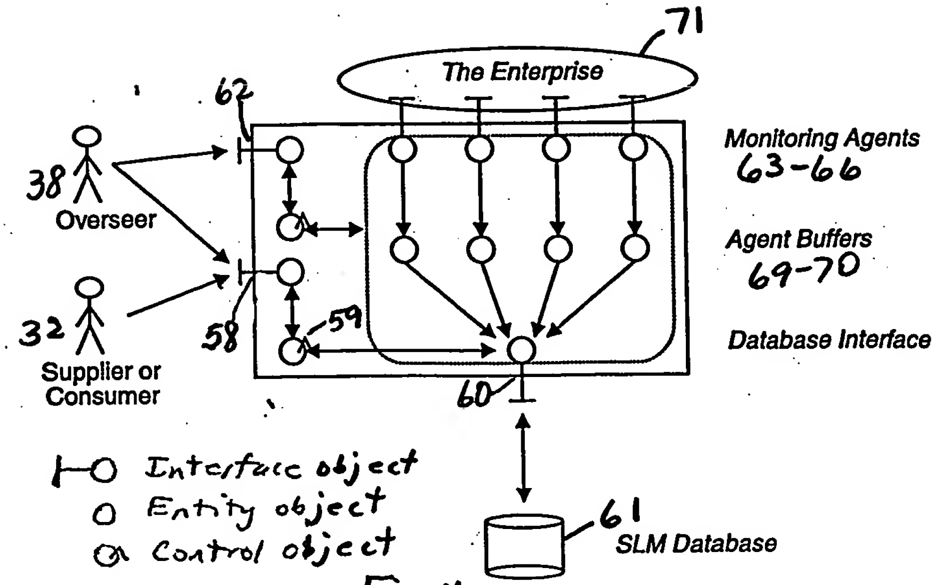

71
The Enterprise
62
Monitoring Agents
63-66
38
Overseer
Agent Buffers
69-70
32
Supplier or
Consumer
58
59
Database Interface
60
Interface object
Entity object
Control object
61
SLM Database

Fig. 4

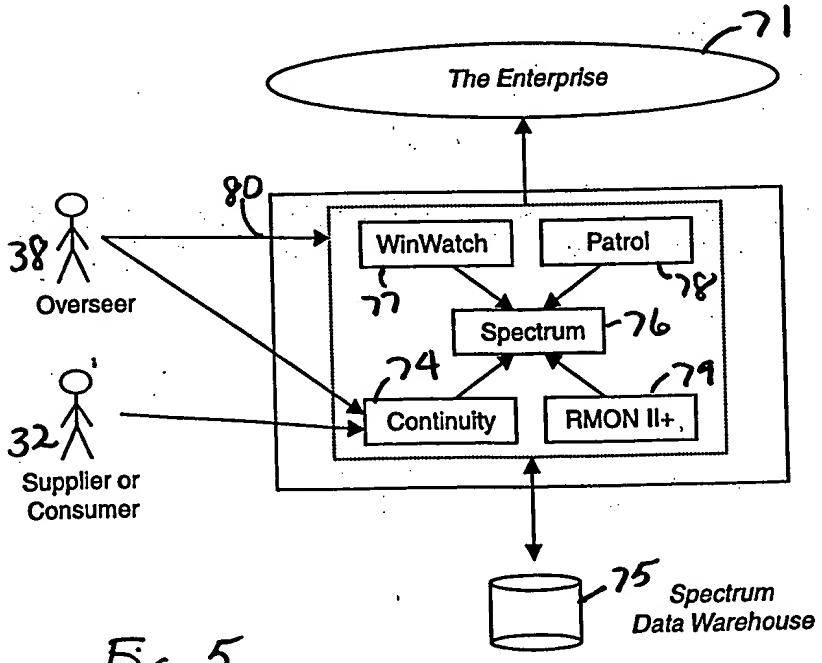

71
The Enterprise
80
38
Overseer
WinWatch
Patrol
77
78
Spectrum
76
74
79
32
Supplier or
Consumer
Continuity
RMON II+
75
Spectrum
Data Warehouse

Fig. 5

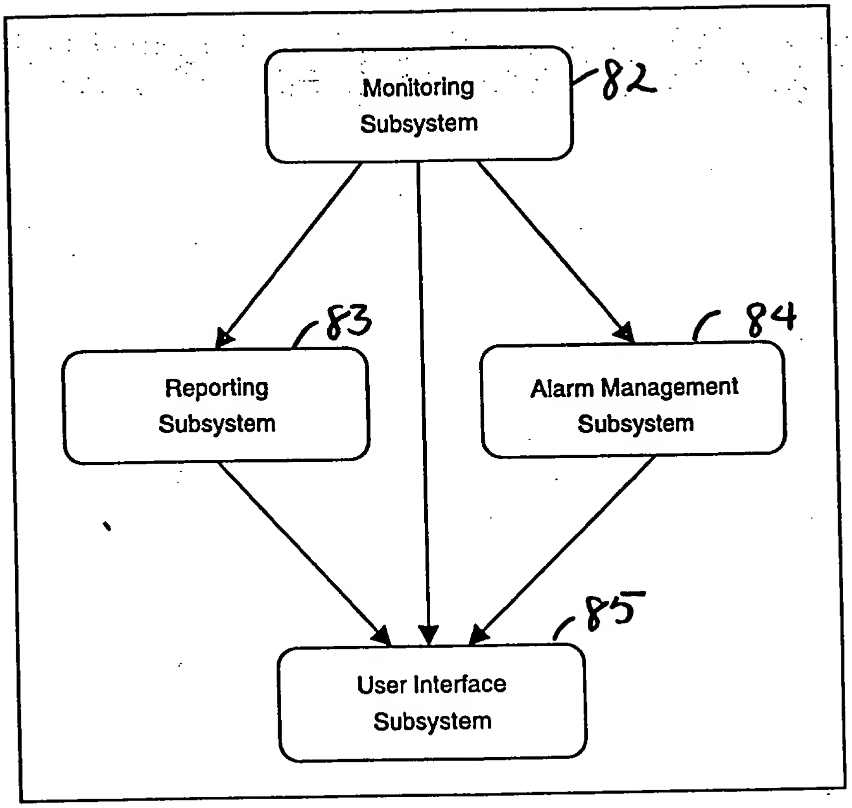

Monitoring Subsystem
82
Reporting Subsystem
83
Alarm Management Subsystem
84
User Interface Subsystem
85

Fig. 6

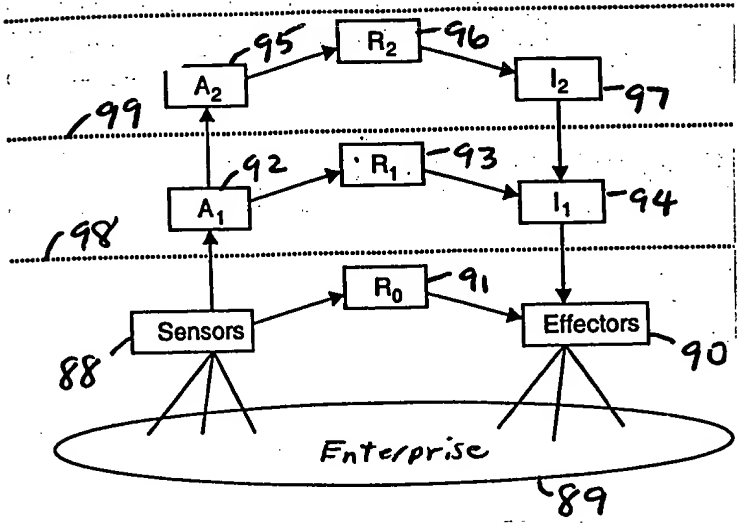

95
R2
96
A2
I2
97
99
92
R1
93
A1
I1
94
98
R0
91
Sensors
Effectors
88
90
Enterprise
89

Fig. 7

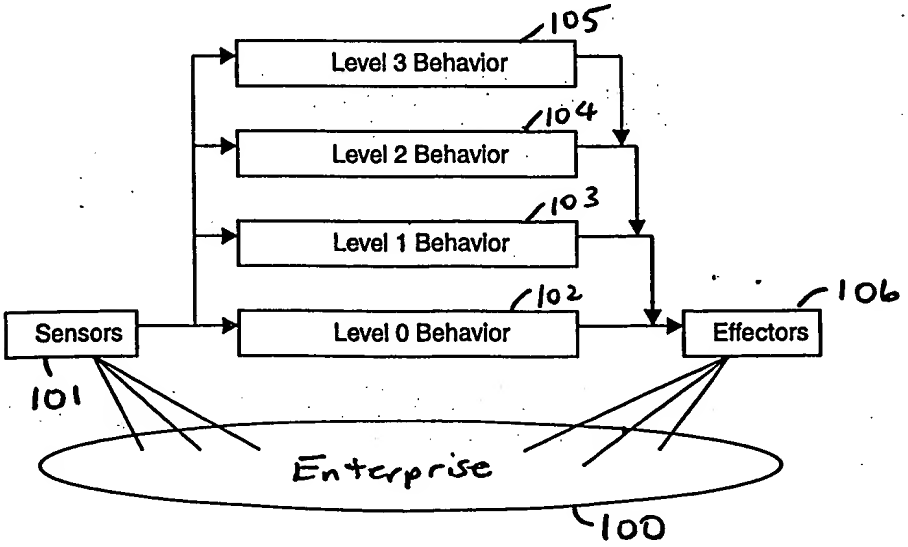

105
Level 3 Behavior
104
Level 2 Behavior
103
Level 1 Behavior
102
Level 0 Behavior
106
Sensors
Effectors
101
Enterprise
100

Fig. 8

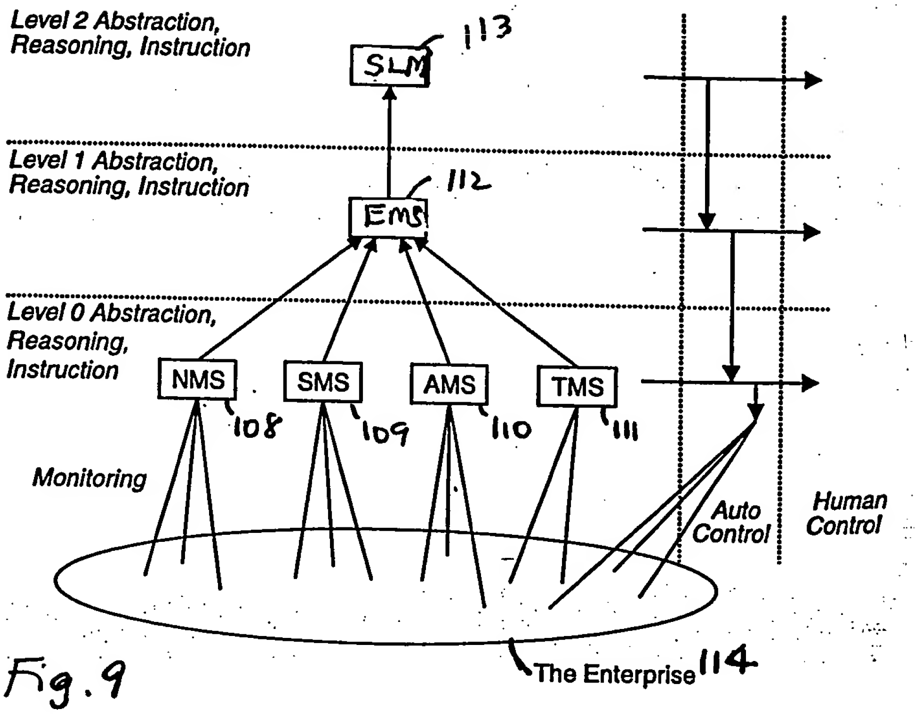

Level 2 Abstraction, Reasoning, Instruction
SLM
113
Level 1 Abstraction, Reasoning, Instruction
EMS
112
Level 0 Abstraction, Reasoning, Instruction
NMS
SMS
AMS
TMS
108
109
110
111
Monitoring
Auto Control
Human Control
The Enterprise
114

Fig. 9

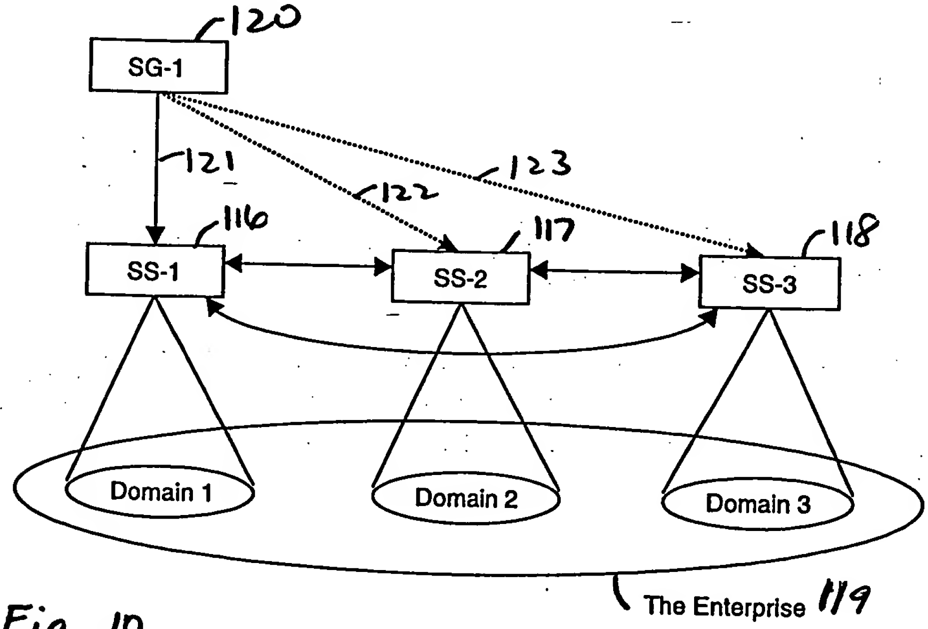

120
SG-1
121
122
123
116
117
118
SS-1
SS-2
SS-3
Domain 1
Domain 2
Domain 3
The Enterprise
119

Fig. 10

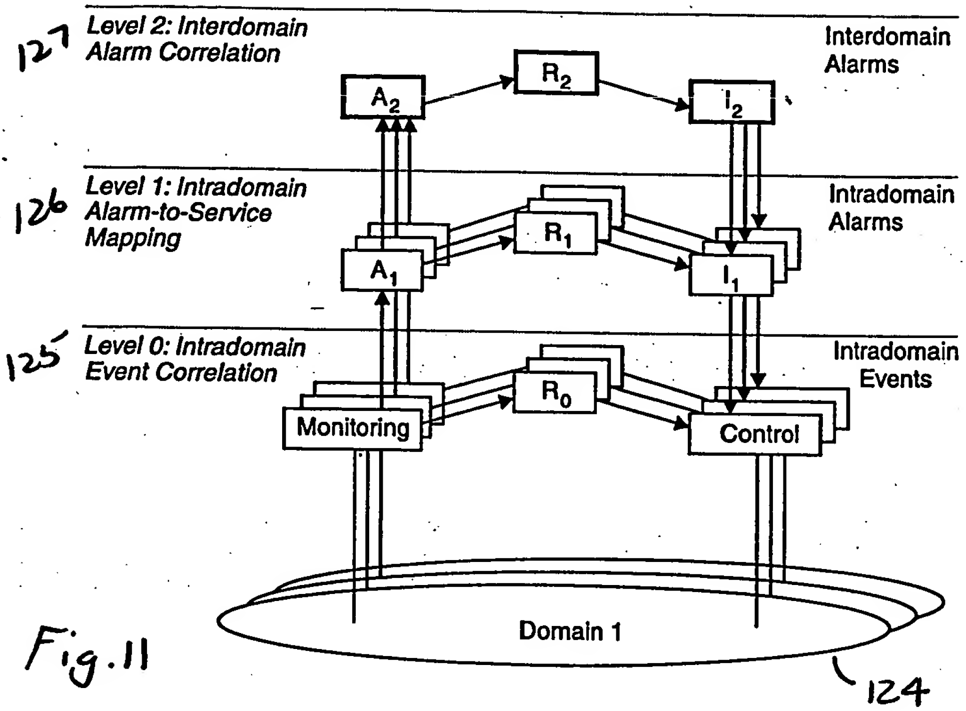

127
Level 2: Interdomain Alarm Correlation
A_2
R_2
I_2
Interdomain Alarms
126
Level 1: Intradomain Alarm-to-Service Mapping
A_1
R_1
I_1
Intradomain Alarms
125
Level 0: Intradomain Event Correlation
Monitoring
R_0
Control
Intradomain Events
Domain 1
124

Fig. 11

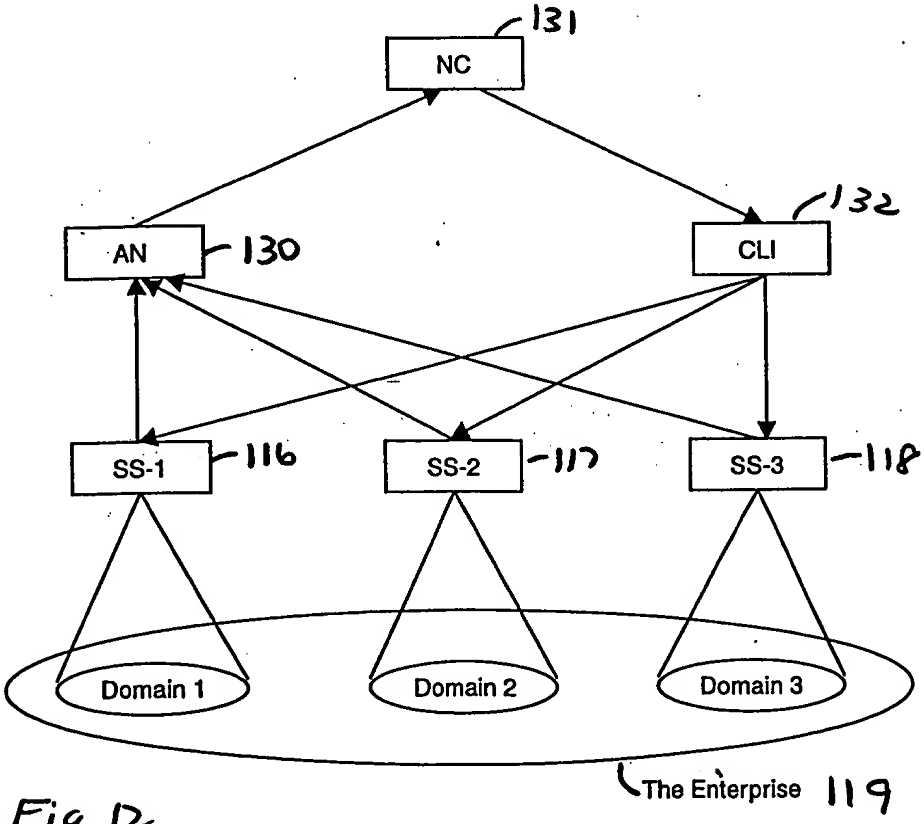

131
NC
AN
130
CLI
132
SS-1
116
SS-2
117
SS-3
118
Domain 1
Domain 2
Domain 3
The Enterprise
119

Fig. 12

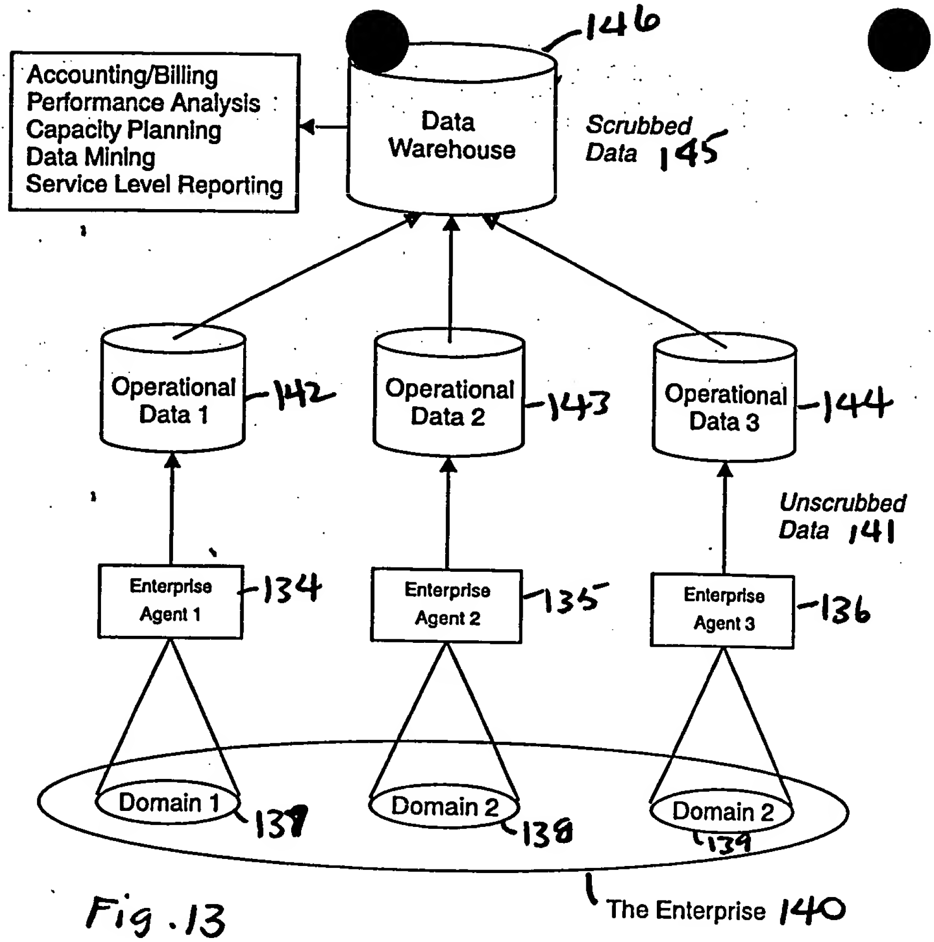

146
Accounting/Billing
Performance Analysis
Capacity Planning
Data Mining
Service Level Reporting
Data Warehouse
Scrubbed Data 145
Operational Data 1
142
Operational Data 2
143
Operational Data 3
144
Unscrubbed Data 141
Enterprise Agent 1
134
Enterprise Agent 2
135
Enterprise Agent 3
136
Domain 1
137
Domain 2
138
Domain 2
139
The Enterprise 140

Fig. 13

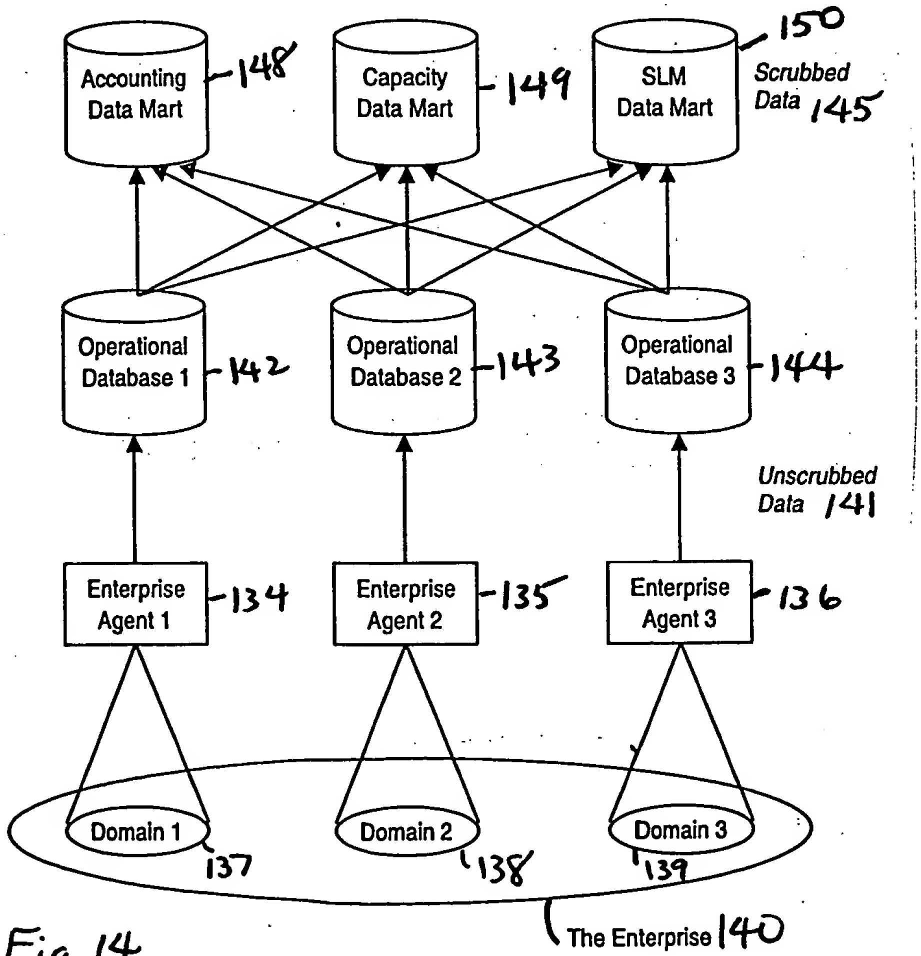
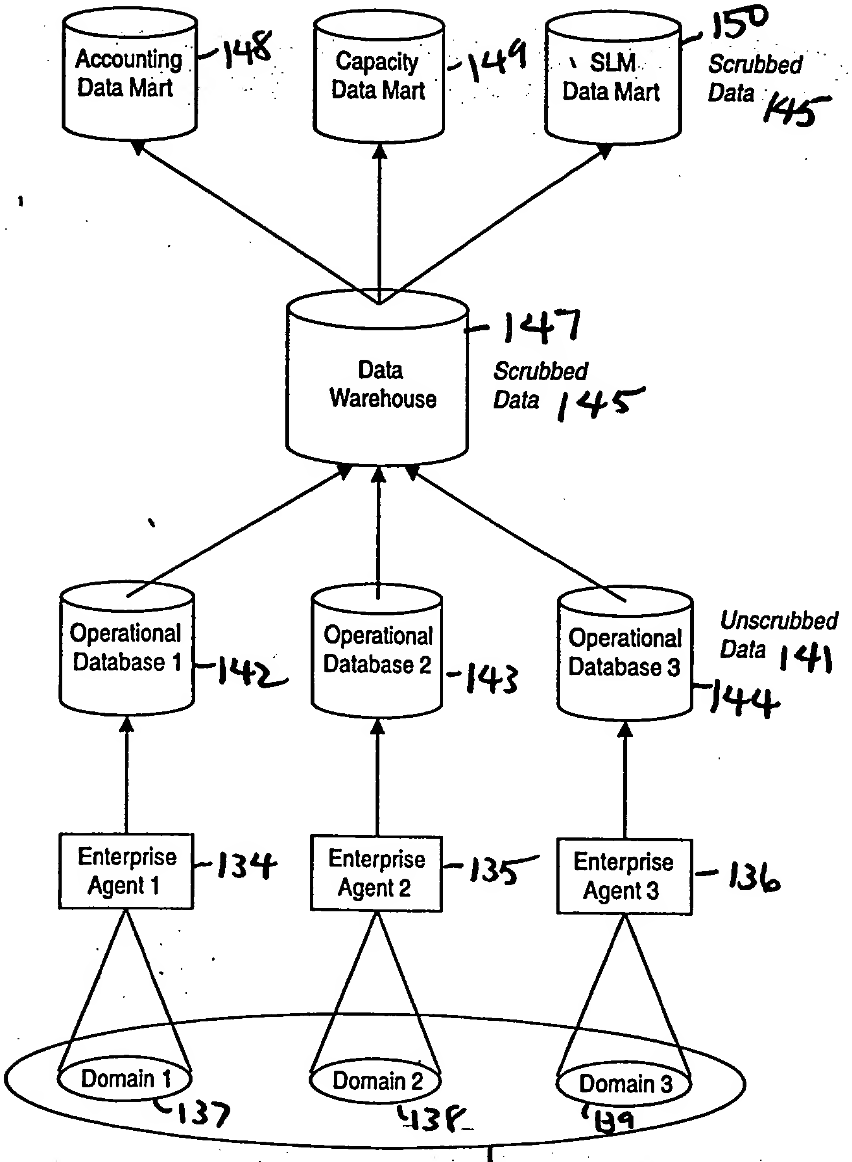

Accounting Data Mart
148
Capacity Data Mart
149
SLM Data Mart
150
Scrubbed Data 145
Operational Database 1
142
Operational Database 2
143
Operational Database 3
144
Unscrubbed Data 141
Enterprise Agent 1
134
Enterprise Agent 2
135
Enterprise Agent 3
136
Domain 1
137
Domain 2
138
Domain 3
139
The Enterprise 140

Fig. 14



Accounting Data Mart
148
Capacity Data Mart
149
SLM Data Mart
150
Scrubbed Data 145
Data Warehouse
147
Scrubbed Data 145
Operational Database 1
142
Operational Database 2
143
Operational Database 3
144
Unscrubbed Data 141
Enterprise Agent 1
134
Enterprise Agent 2
135
Enterprise Agent 3
136
Domain 1
137
Domain 2
138
Domain 3
139
The Enterprise 140

Fig. 15

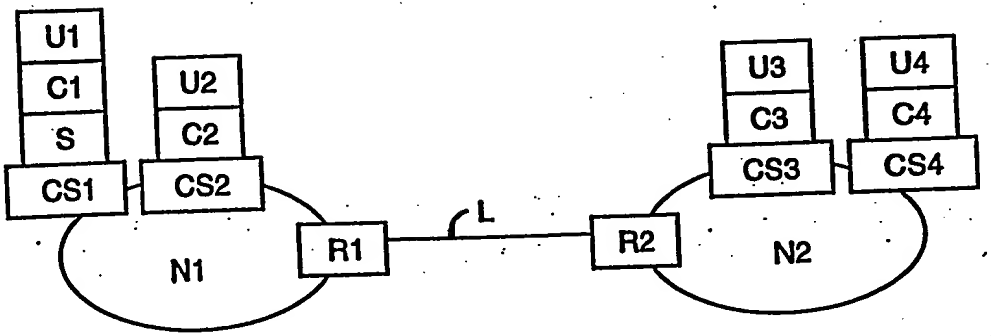


Figure 5.1. *Fig. 16*

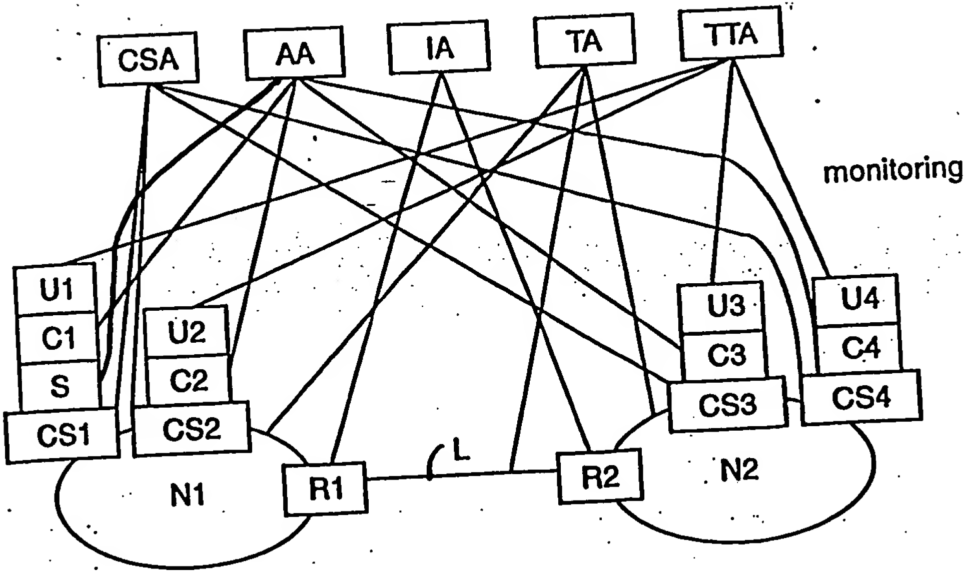


Figure 5.2 *Fig. 17*

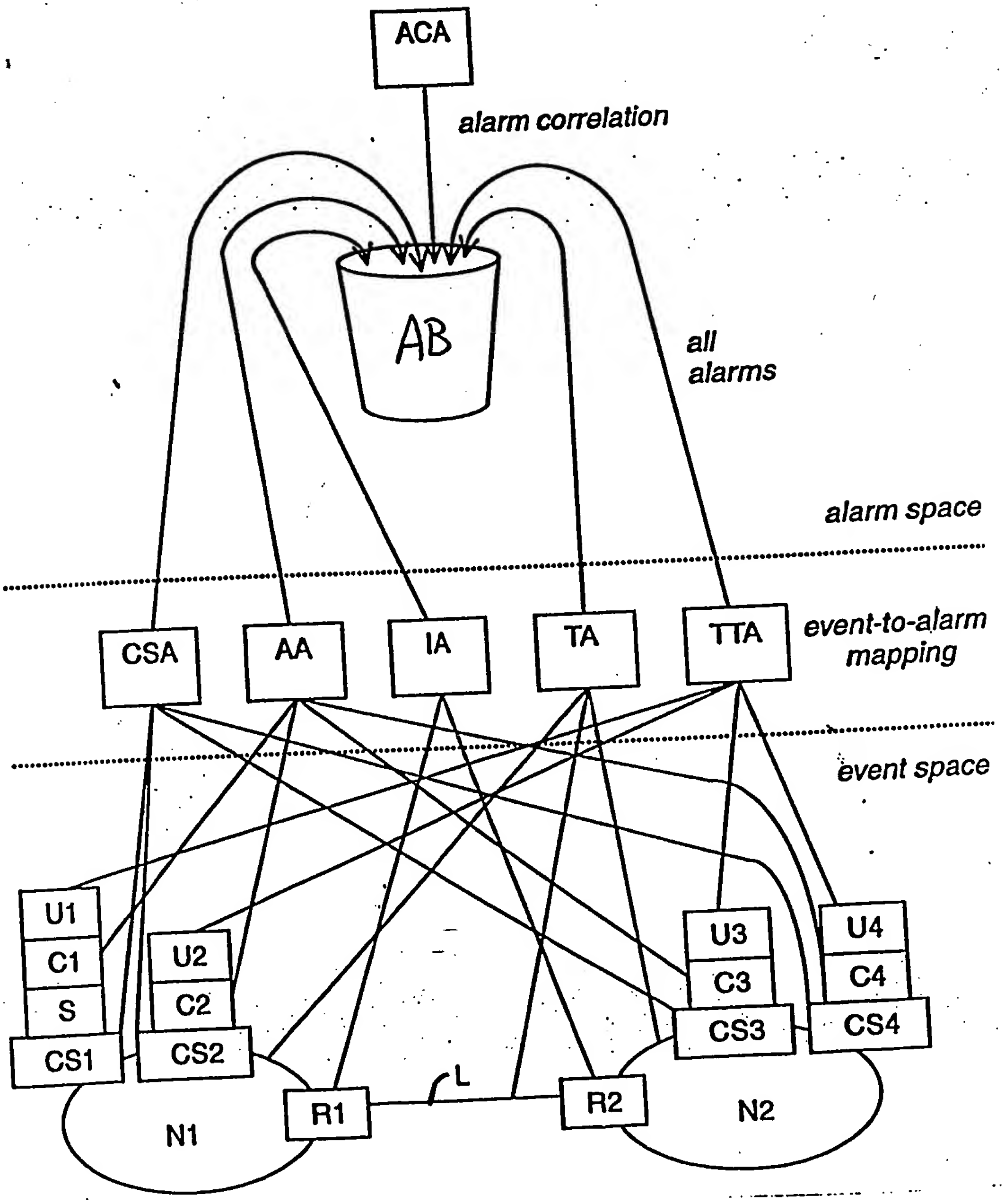


Figure 5.5 Fig. 18

Fig. 19

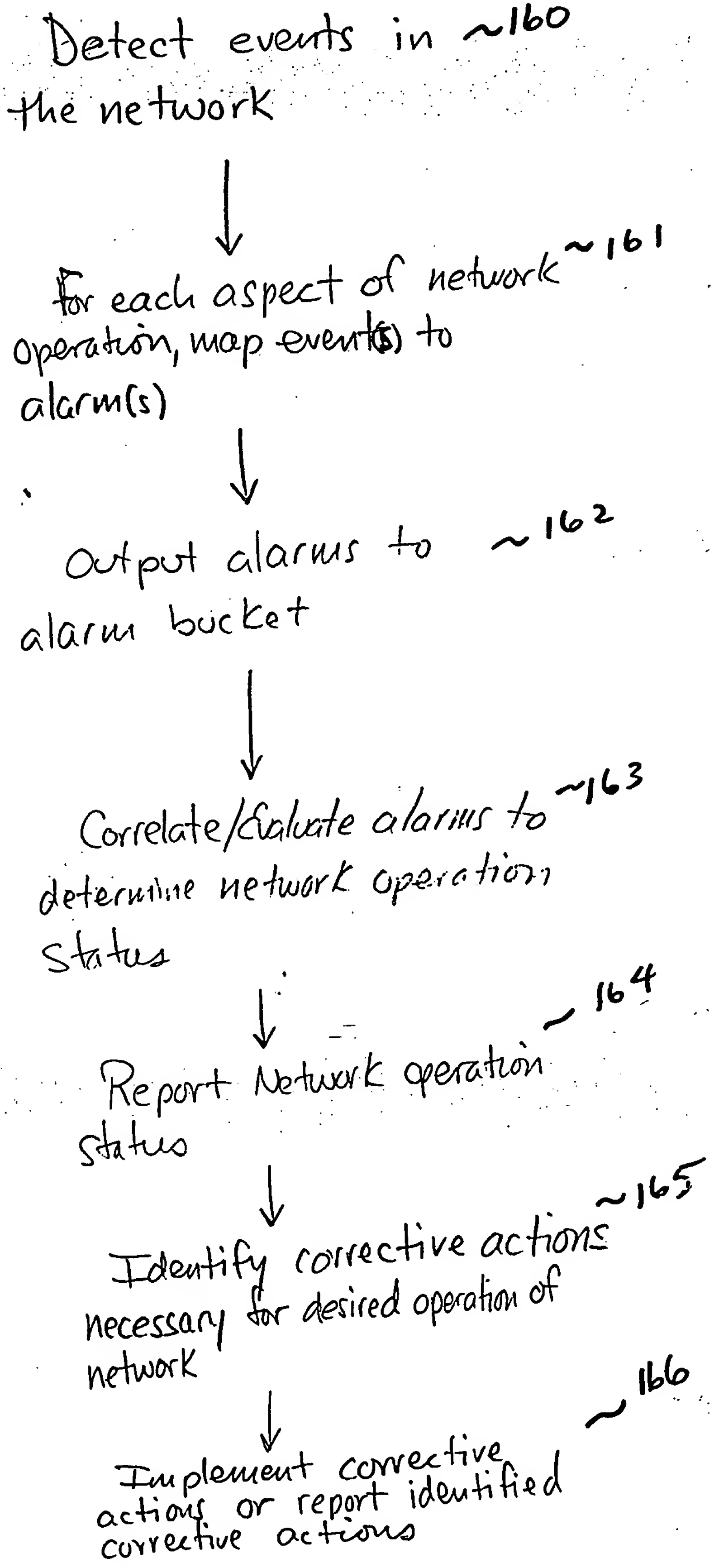
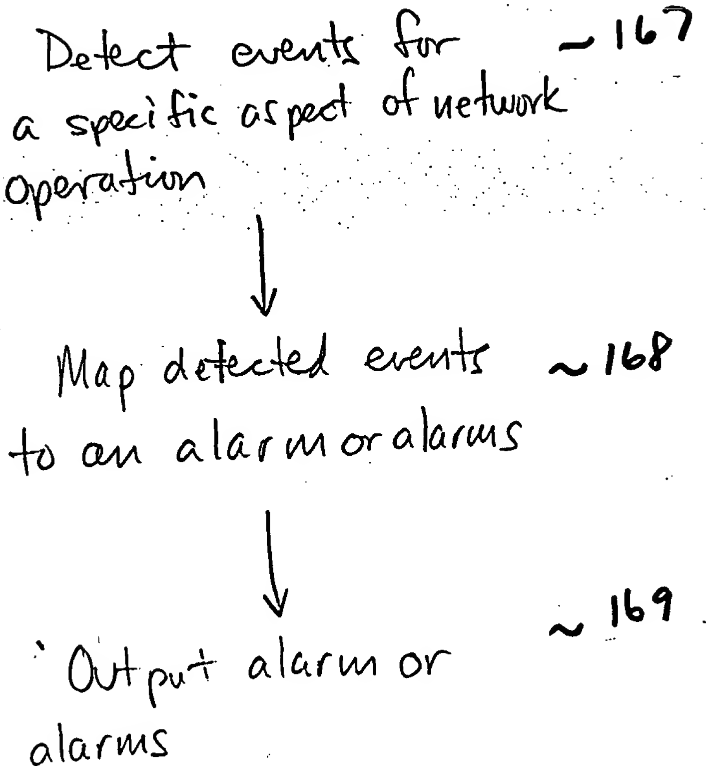

Detect events in the network ~160
For each aspect of network operation, map event(s) to alarm(s) ~161
Output alarms to alarm bucket ~162
Correlate/Evaluate alarms to determine network operation status ~163
Report Network operation status ~164
Identify corrective actions necessary for desired operation of network ~165
Implement corrective actions or report identified corrective actions ~166

Fig. 20


Detect events for a specific aspect of network operation
~167
Map detected events to an alarm or alarms
~168
Output alarm or alarms
~169

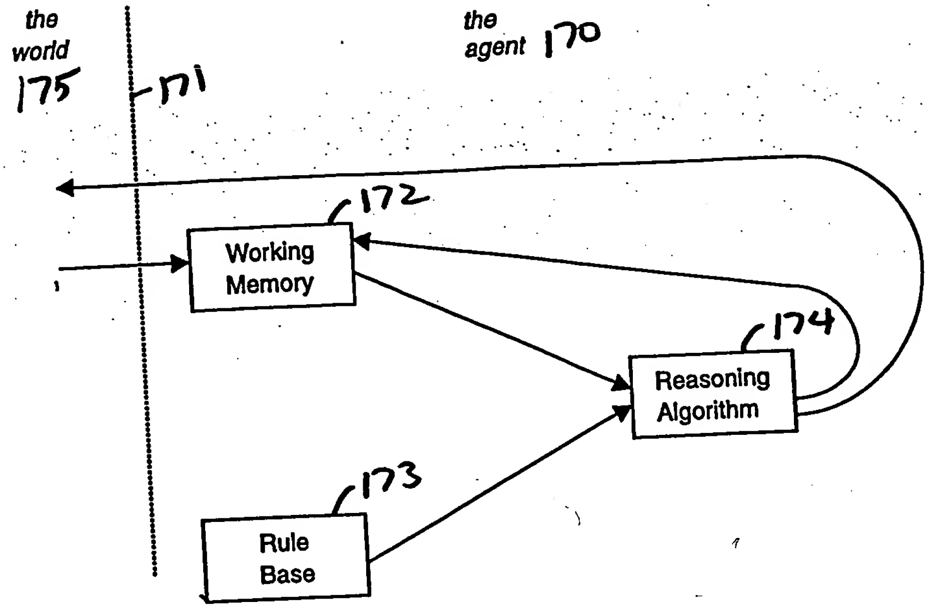

the world
175
171
the agent 170
172
Working Memory
174
Reasoning Algorithm
173
Rule Base

Fig. 21

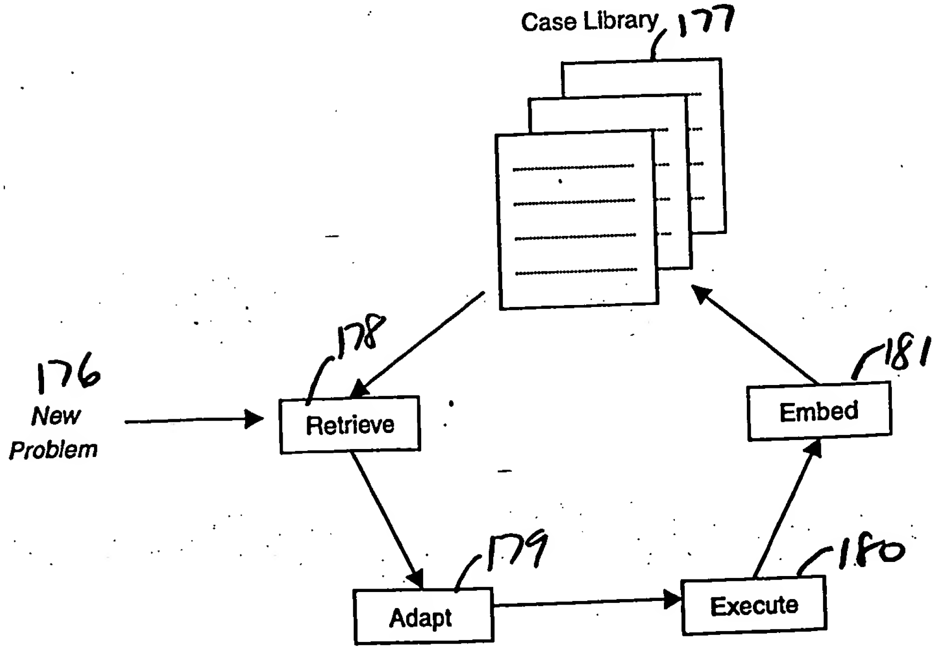

Case Library 177
176
New Problem
178
Retrieve
179
Adapt
180
Execute
181
Embed

Fig. 22

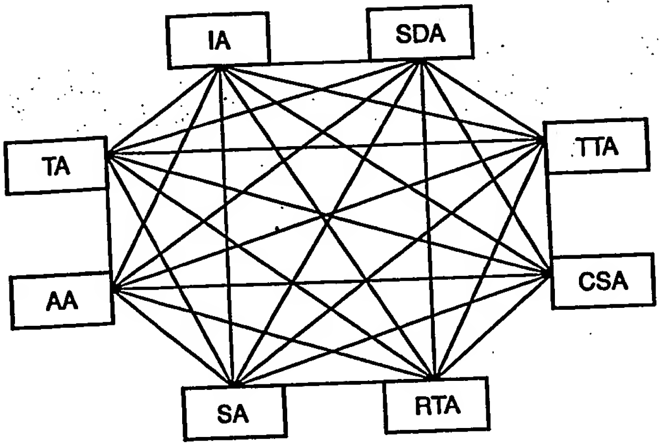


Fig. 23

190

Friday January 5 2001 —191	Service 1	Service 2	Service 3
Seattle			
Bldg 1	Up	Up	Down, up at 12 PM
Bldg 2	Down 8-10 PM	Down 8-10 PM	Down 8-10PM
Bldg 3	Up (Slow)	Up	Up
Sydney			
Bldg 1	Up	Up	Down, up ?
Bldg 2	Up	Up (slow)	Up
. . .			

Fig. 24

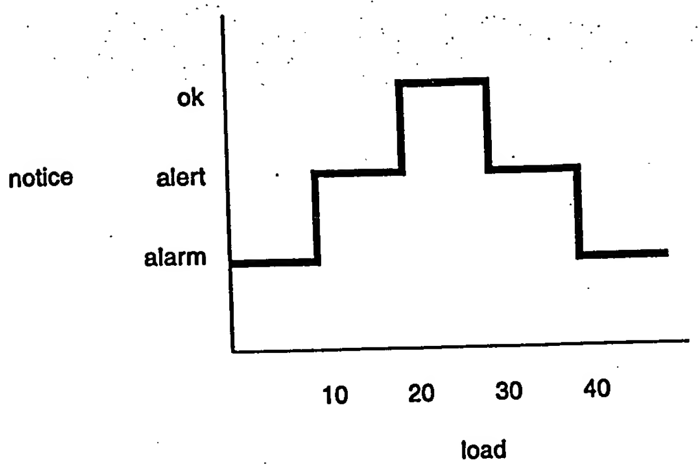

ok
notice
alert
alarm
10
20
30
40
load

Fig. 25

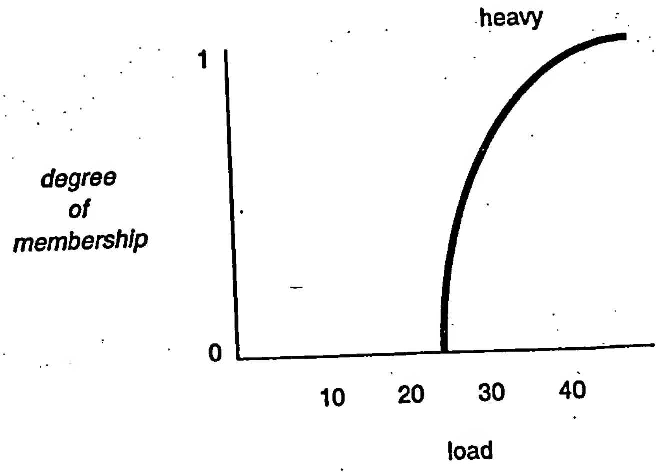

heavy
1
degree
of
membership
0
10
20
30
40
load

Fig. 26

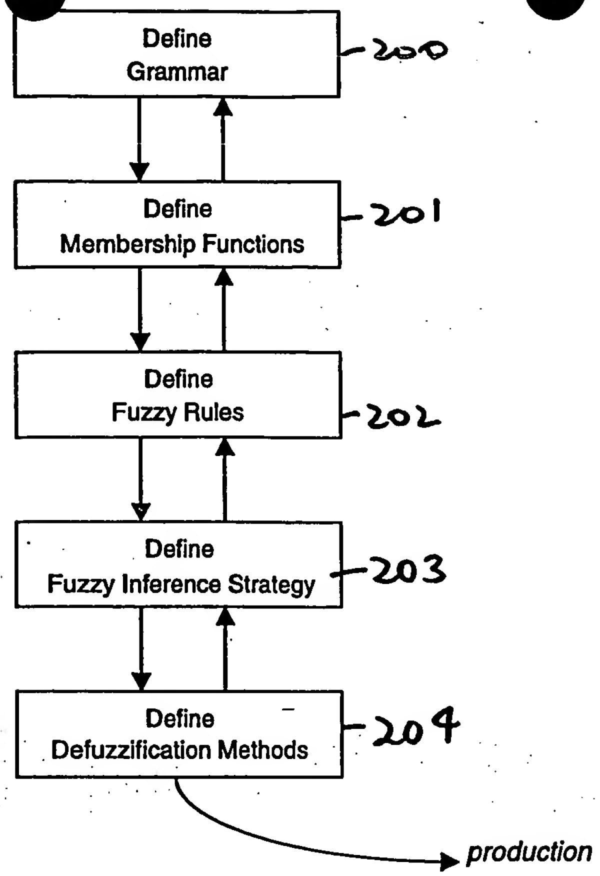

Define Grammar
200
Define Membership Functions
201
Define Fuzzy Rules
202
Define Fuzzy Inference Strategy
203
Define Defuzzification Methods
204
production

Fig. 27

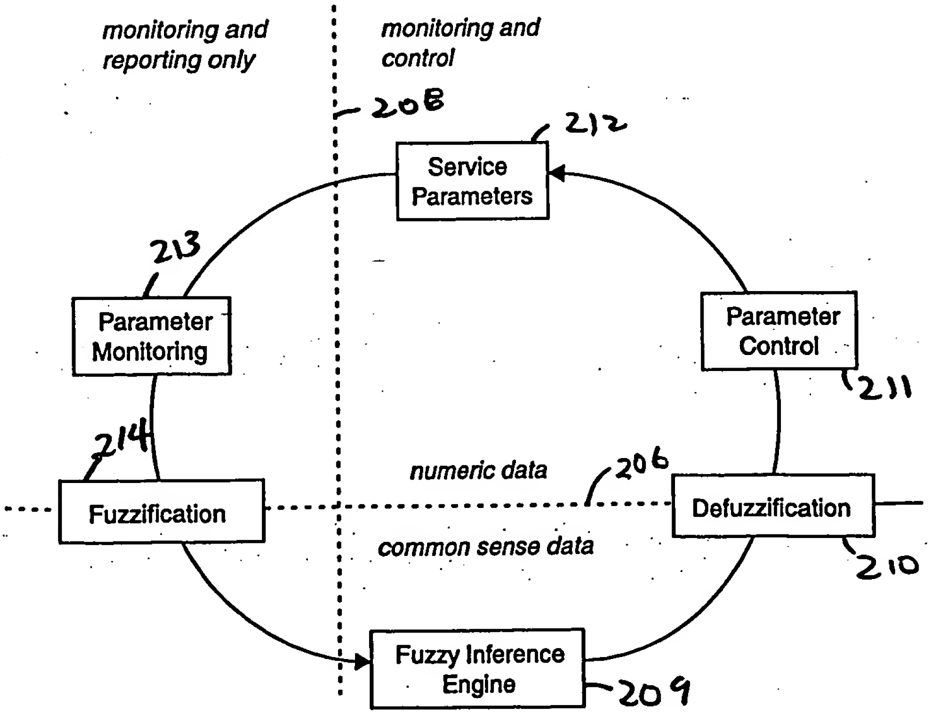

monitoring and reporting only
monitoring and control
208
212
Service Parameters
213
Parameter Monitoring
Parameter Control
211
214
numeric data
206
Fuzzification
Defuzzification
common sense data
210
Fuzzy Inference Engine
209

Fig. 28

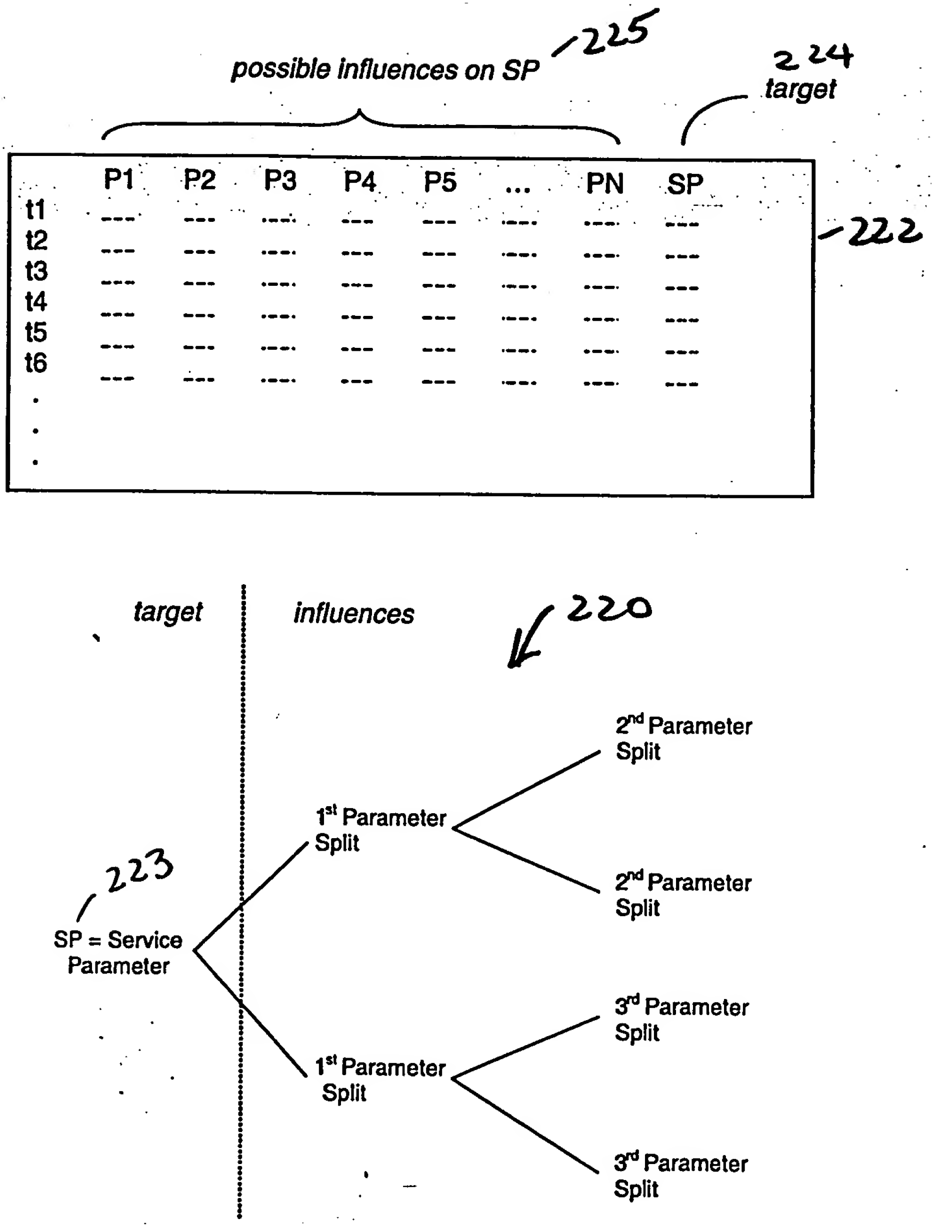

possible influences on SP
225
224
target
P1
P2
P3
P4
P5
...
PN
SP
t1
t2
t3
t4
t5
t6
222
target
influences
220
2nd Parameter Split
1st Parameter Split
2nd Parameter Split
223
SP = Service Parameter
3rd Parameter Split
1st Parameter Split
3rd Parameter Split

Fig. 29

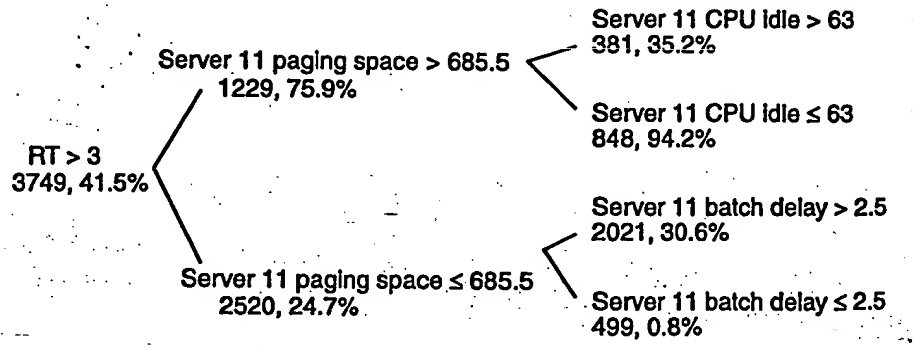

RT > 3
3749, 41.5%
Server 11 paging space > 685.5
1229, 75.9%
Server 11 CPU idle > 63
381, 35.2%
Server 11 CPU idle ≤ 63
848, 94.2%
Server 11 paging space ≤ 685.5
2520, 24.7%
Server 11 batch delay > 2.5
2021, 30.6%
Server 11 batch delay ≤ 2.5
499, 0.8%

Fig. 30

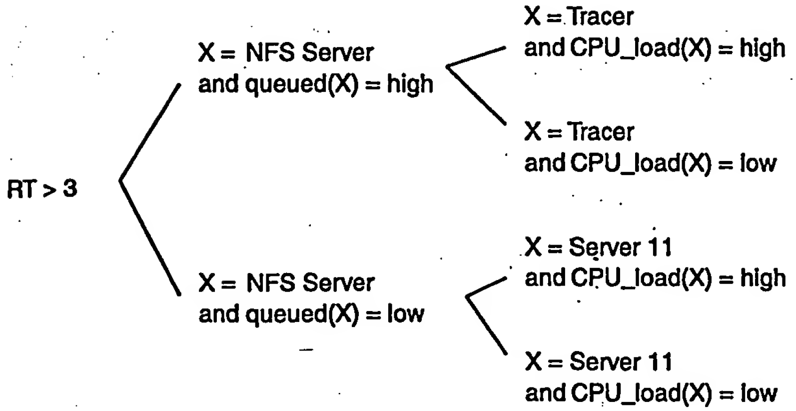
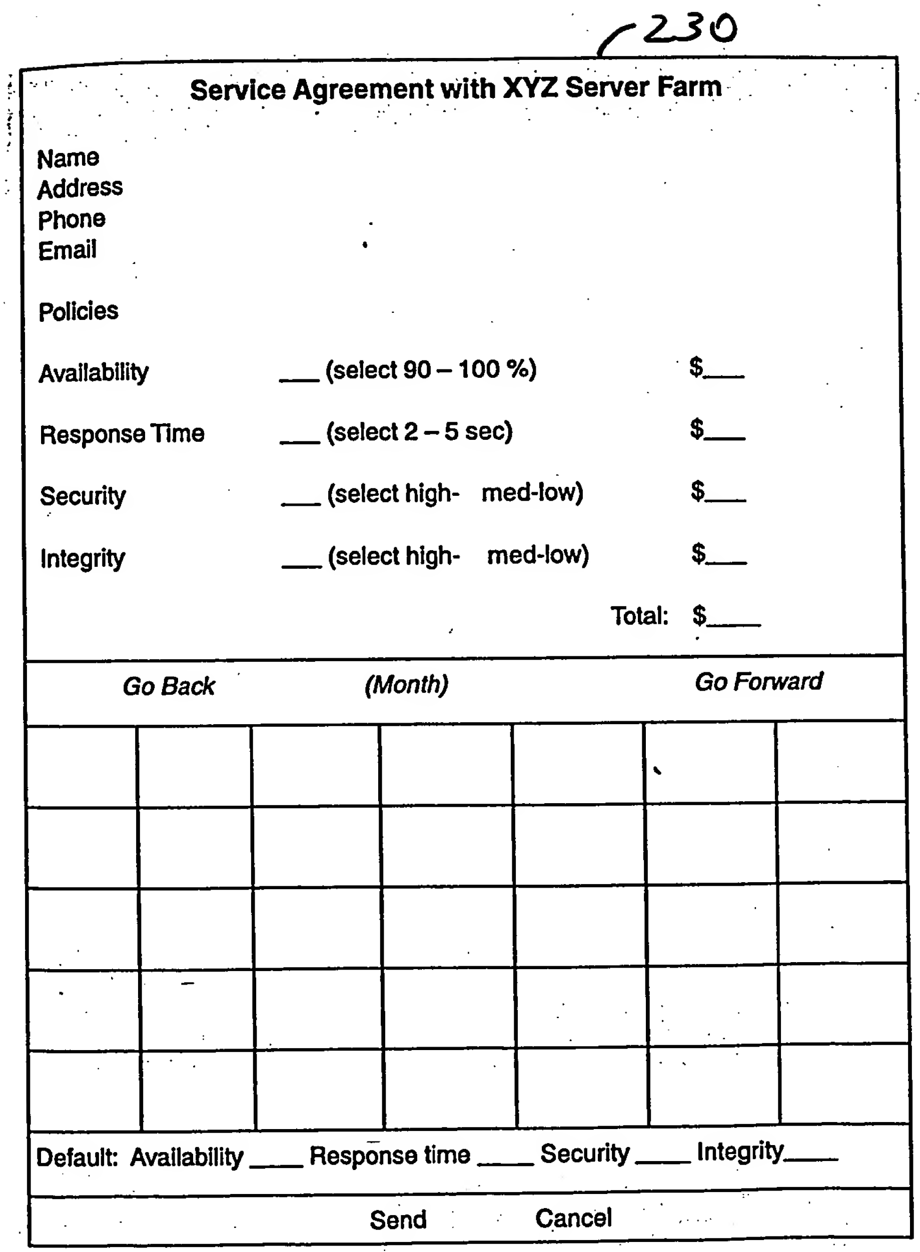

RT > 3
X = NFS Server
and queued(X) = high
X = Tracer
and CPU_load(X) = high
X = Tracer
and CPU_load(X) = low
X = NFS Server
and queued(X) = low
X = Server 11
and CPU_load(X) = high
X = Server 11
and CPU_load(X) = low

Fig. 31



Service Agreement with XYZ Server Farm

Name
Address
Phone
Email

Policies

Availability	___ (select 90 – 100 %)	$___
Response Time	___ (select 2 – 5 sec)	$___
Security	___ (select high- med-low)	$___
Integrity	___ (select high- med-low)	$___
	Total:	$___

Default: Availability ____ Response time ____ Security ____ Integrity____

Fig. 32

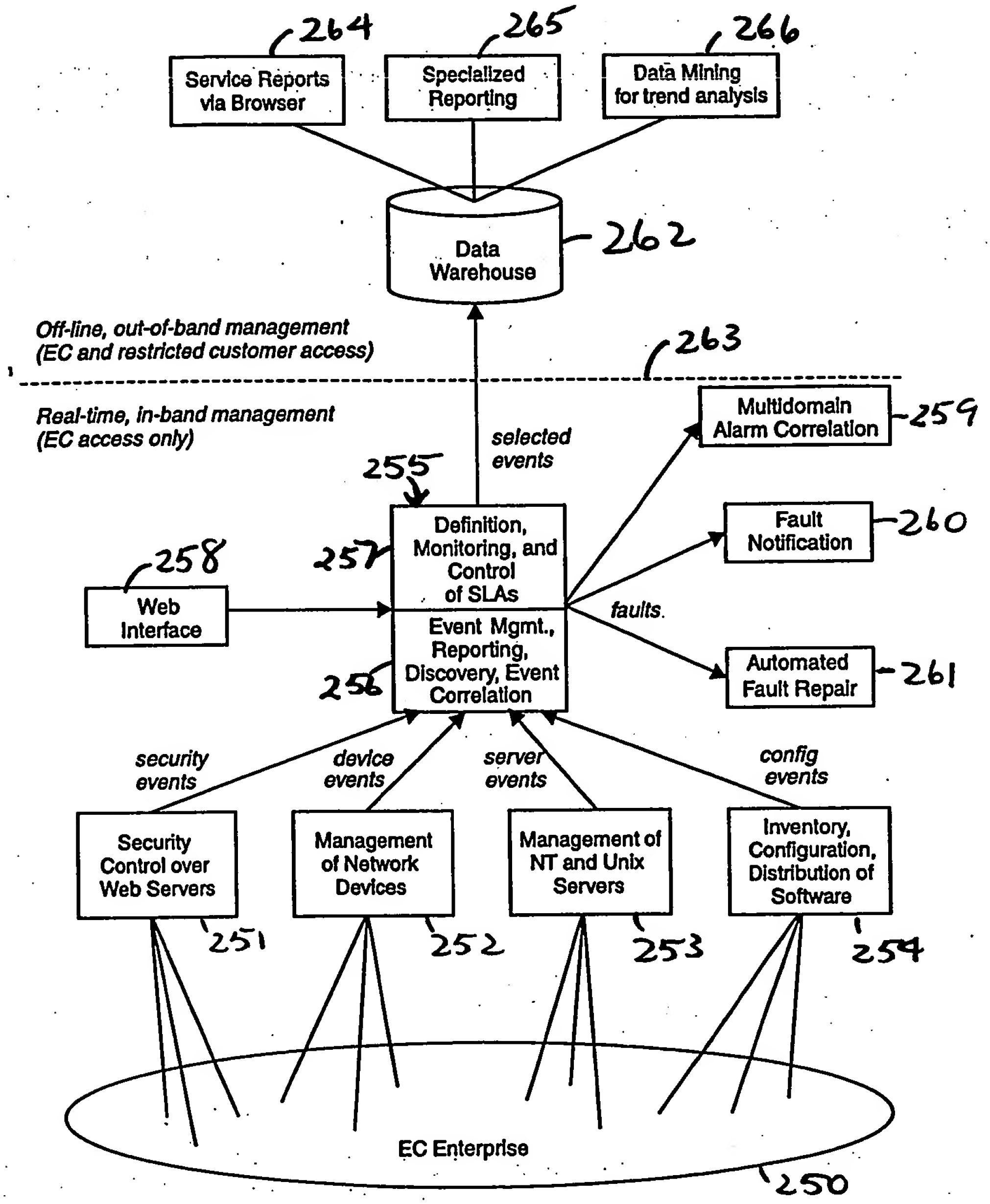

264
Service Reports via Browser
265
Specialized Reporting
266
Data Mining for trend analysis
Data Warehouse
262
Off-line, out-of-band management (EC and restricted customer access)
263
Real-time, in-band management (EC access only)
selected events
255
Multidomain Alarm Correlation
259
Fault Notification
260
258
Web Interface
257
Definition, Monitoring, and Control of SLAs
Event Mgmt., Reporting, Discovery, Event Correlation
256
faults
Automated Fault Repair
261
security events
device events
server events
config events
Security Control over Web Servers
251
Management of Network Devices
252
Management of NT and Unix Servers
253
Inventory, Configuration, Distribution of Software
254
EC Enterprise
250

Fig. 33

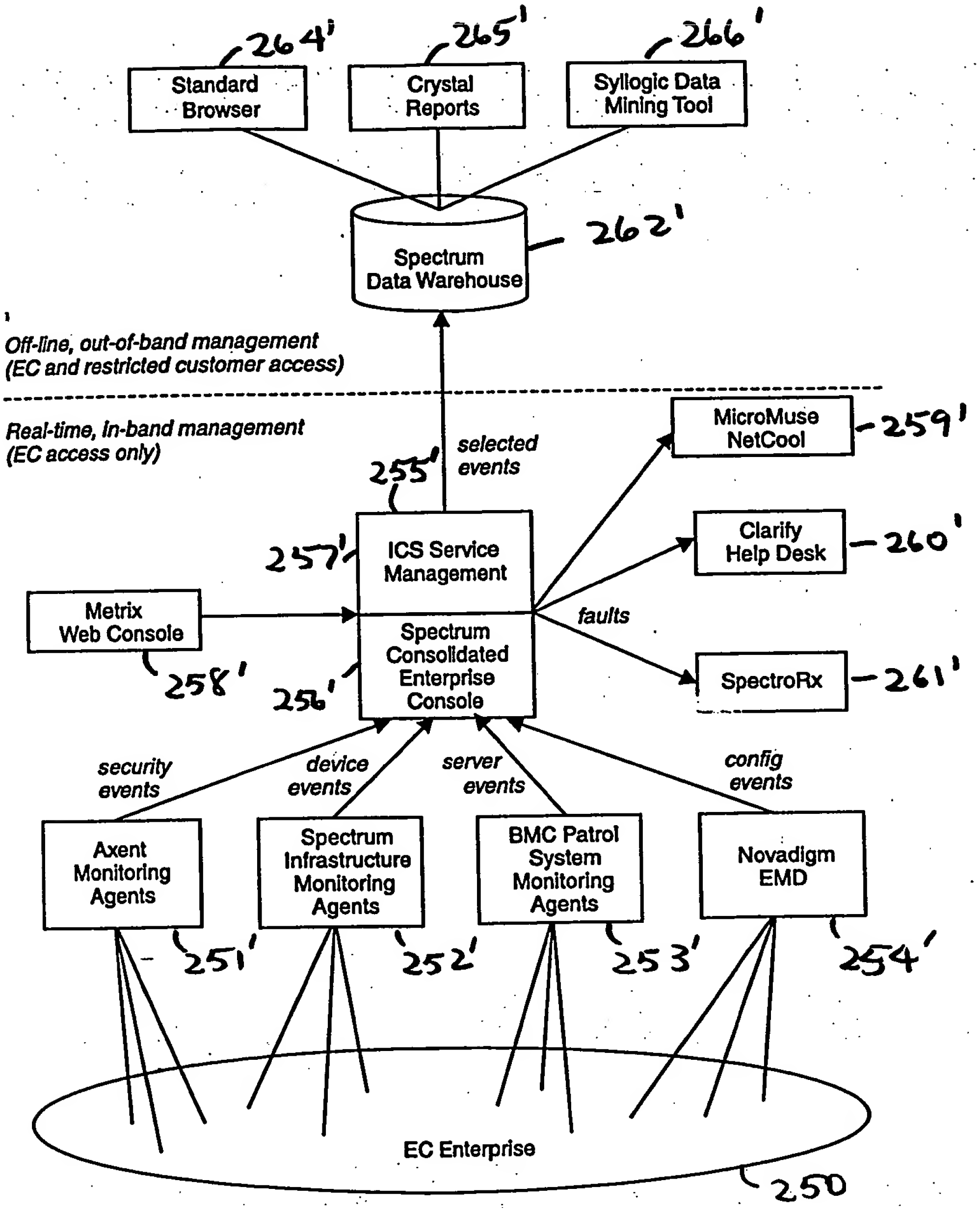

264'
Standard Browser
265'
Crystal Reports
266'
Syllogic Data Mining Tool
Spectrum Data Warehouse
262'
Off-line, out-of-band management
(EC and restricted customer access)
Real-time, in-band management
(EC access only)
selected events
255'
MicroMuse NetCool
259'
Clarify Help Desk
260'
257'
ICS Service Management
Metrix Web Console
258'
Spectrum Consolidated Enterprise Console
256'
faults
SpectroRx
261'
security events
device events
server events
config events
Axent Monitoring Agents
251'
Spectrum Infrastructure Monitoring Agents
252'
BMC Patrol System Monitoring Agents
253'
Novadigm EMD
254'
EC Enterprise
250

Fig. 34

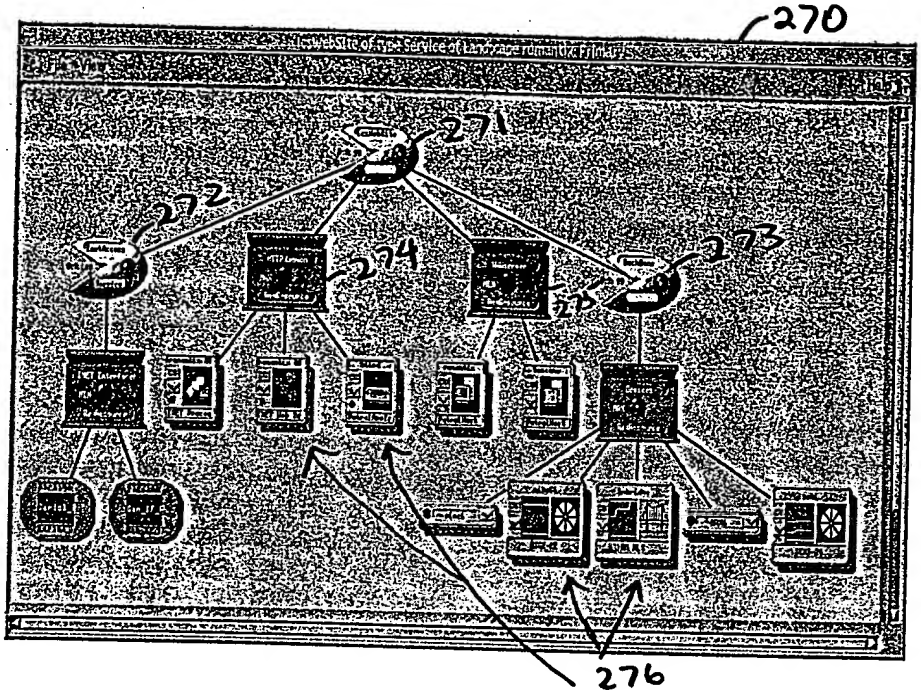
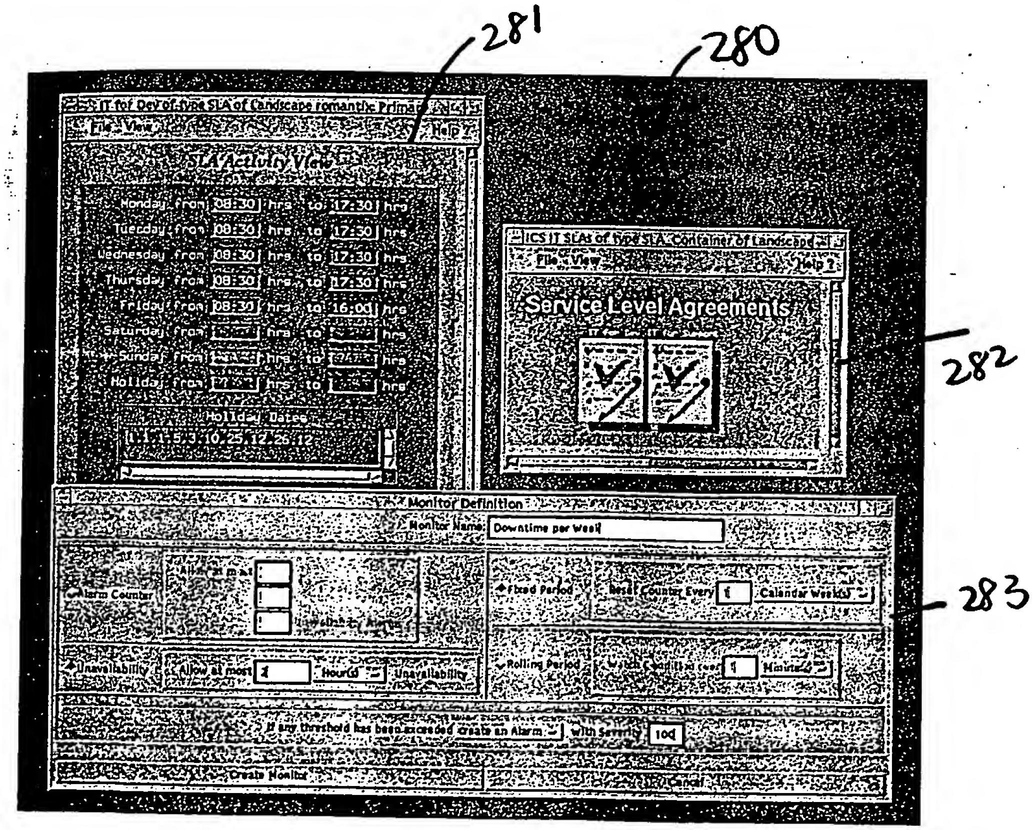


Fig. 35



IT for Dev of type SLA of Landscape romantic Primar

File View Help ?

SLA Activity View

Monday from 08:30 hrs to 17:30 hrs
Tuesday from 08:30 hrs to 17:30 hrs
Wednesday from 08:30 hrs to 17:30 hrs
Thursday from 08:30 hrs to 17:30 hrs
Friday from 08:30 hrs to 16:00 hrs
Saturday from hrs to hrs
Sunday from hrs to hrs
Holiday from hrs to hrs

Holiday Dates
1.1.1.5.3.10.25.12.26.12

ICS IT SLAs of type SLA Container of Landscape

File View Help ?

Service Level Agreements

Monitor Definition

Monitor Name: Downtime per Week

Alarm Counter

Unavailability Allow at most 2 Hour(s) Unavailability

◆ Fixed Period Reset Counter Every 1 Calendar Week(s)

Rolling Period [illegible] 1 Minute(s)

If any threshold has been exceeded create an Alarm with Severity 100

Create Monitor

Cancel

Fig. 36

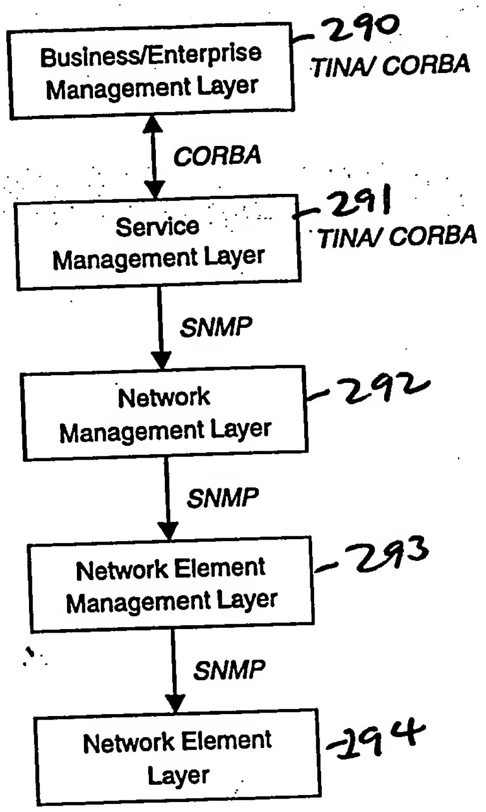

Business/Enterprise Management Layer
290
TINA/ CORBA
CORBA
Service Management Layer
291
TINA/ CORBA
SNMP
Network Management Layer
292
SNMP
Network Element Management Layer
293
SNMP
Network Element Layer
294

Fig. 37

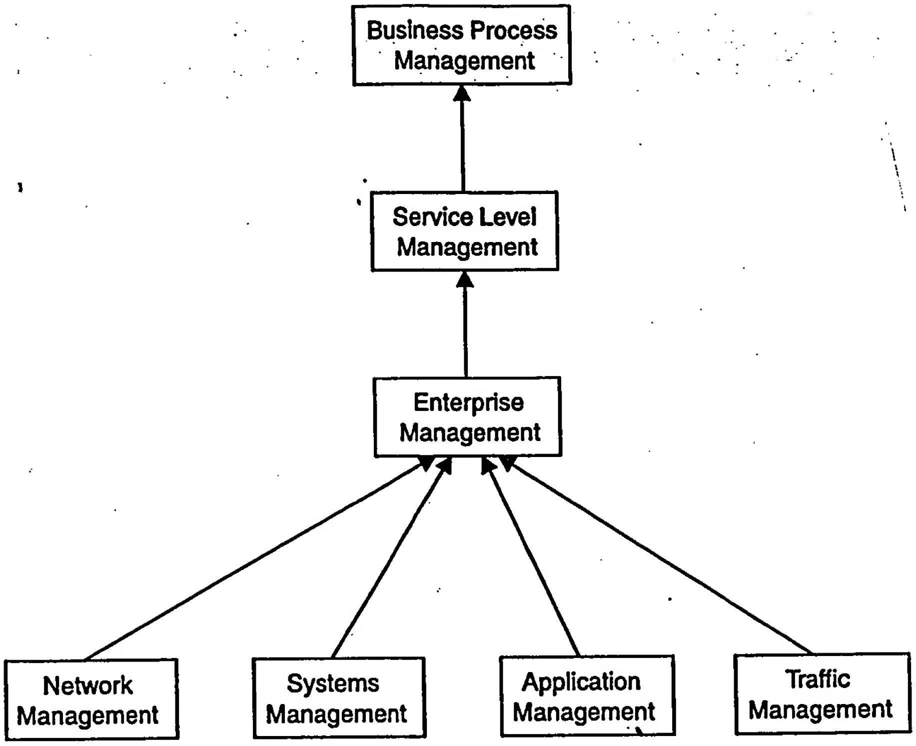

Business Process Management
Service Level Management
Enterprise Management
Network Management
Systems Management
Application Management
Traffic Management

Fig. 38